CLAIMS

We claim:

1. In a communications system including a first modem operatively connected to a second modem via a communications network comprising digital trunks with possible digital impairments of repetitive nature with a repetition frame consisting of one or more time slots and analog loops, the first modem performing a method of compensating for inter-modulation distortion (IMD) present in signals received from said second modem, said method for compensating comprising the steps of:

first, preprocessing to minimize effect of impairments other than IMD, so as to derive best estimates x′ of the received values that would correspond to a set of transmit values y

second, deriving IMD based constant I from x′

third, removing the IMD component from the received estimates x′ to derive a IMD removed new estimate x′′ in accordance with the equation:

$$x'' = x' - I(by^3)$$

where b is a system constant.

2. The method of claim 1 wherein said step of preprocessing comprises the steps of:

(a) minimizing correlative analog impairments effects on received values caused by the analog section in the signal path,

(b) averaging samples of the received values of step (a) to minimize noise effects on the samples corresponding to a set of digital codes transmitted, for each time slot in the repetitive frame of digital trunk,

(c) detecting digital impairments of a repetitive nature and averaging similar time slot values in a repetitive frame, and

(d) averaging time slots in which the digital impairment is not present to generate the preprocessed values x'.

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3. The method of claim 2, wherein in said step (c) the digital impairments correspond to Robbed Bit Signalling in a digital trunk, said step (c) further comprising the steps of:

for each time slot in a repetitive frame, selecting a set N of averaged values of higher power samples and computing N-1 distances between adjacent samples and measuring the number M of distances that are close to zero within the noise tolerance, and

marking time slots in which the number M is above a threshold (M_RBS) as the Robbed Bit Signalling slots.

4. The method of claim 1, wherein said step of deriving IMD based constant I from x′ further comprises the steps of:

calculating distances between consecutive preprocessed receive levels,

normalizing all distances based on distances between lower power receive level values which are insensitive to the IMD level, and

performing linear regression on the normalized distance and obtaining the slope of the line that corresponds to the IMD constant I.

5. The method of claim 1, wherein said step of removing the IMD component from the received estimates x′ to derive a IMD removed new estimate x′′ comprises the steps of:

calculating a distortion amount $I*(by^3)$ by multiplying the derived IMD constant I of claim 1, by a stored table based on the communication channel for each preprocessed received value x′,

subtracting the calculated distortion calculated from x′ and storing the IMD removed x′′ for all transmitted values y.

6. The method of claim 1, wherein mu-law or A-law encoding is used, the preprocessed receive values x′, the IMD removed receive

values x'', and the transmit values y are indexed using Ucode in ascending magnitudes.

7. The method of claim 6, wherein the Ucode values span from Ucode 72 to Ucode 105.

8. The method of claim 3, wherein the repetitive frame of digital impairments is one of 6, 12, or 24 time slots.

9. The method of claim 3, wherein the Robbed Bit Signalling uses N=35 from Ucode 72 to Ucode 105 for processing and the M_RBS threshold for zero distances is set to be 10.

10. The method of claim 5, wherein the stored table for mu-law or A-law encoding system is as follows:

UCode	(by^3)	UCode	(by^3)	UCode	(by^3)	UCode	(by^3)
72	.0049	81	.0148	90	.0530	99	.1721
73	.0055	82	.0176	91	.0593	100	.2004
74	.0062	83	.0207	92	.0662	101	.2316
75	.0070	84	.0241	93	.0735	102	.2658
76	.0078	85	.0279	94	.0814	103	.3033
77	.0087	86	.0321	95	.0898	104	.3442
78	.0097	87	.0367	96	.1035	105	.3885
79	.0107	88	.0417	97	.1238	--	--
80	.0123	89	.0471	98	.1467	--	--

11. The method of claim 1, further comprising the step of setting limits, in the first modem, on constellation levels which the second modem transmits to the first modem, the limits based upon the calculated IMD.